We Claim:

1. An injection port adapted for use with an intravenous line, comprising:

a housing defining a flow channel and having an injection lumen extending in fluid communication with the flow channel;

first portions of the housing defining a first valve seat around the injection lumen;

second portions of the housing defining a second valve seat around the injection lumen;

a valve element disposed to extend transverse to the injection lumen;

the valve element having properties for forming a first seal with the first valve seat at a first pressure;

the valve element having properties for forming a second seal with the second valve seat in response to a second pressure greater than the first pressure of the fluid in the flow channel, and

the valve element having properties for forming an open configuration between said lumen and said flow channel in response to a third pressure in said lumen greater than one of said first pressure and said second pressure.

2. The injection port recited in Claim 1, further comprising:

third portions of the housing defining a third valve seat on the side of the valve element opposite the first and second valve seats; and

the valve element having properties for forming a third seal with the third valve seat.

3. The injection port recited in Claim 2, wherein the valve element has properties for opening at least the first seal for said open configuration under the pressure of an injectate in the injection lumen to create a flow path around the valve element between the injection lumen and the flow channel; and

the valve element has properties for opening the third seal in response to a partial vacuum in the injection lumen to aspirate a portion of the fluid in the flow channel through an aperture in the valve element and into the injection lumen.

4. An injection manifold adapted to be disposed in an intravenous line extending from an intravenous reservoir to a patient, the manifold comprising:

a first body member;

a second body member forming with the first body member a housing;

first portions of the housing defining a flow channel to receive the IV solution flowing in the IV line;

second portions of the housing defining at least one port with an injection lumen, the port having an outside diameter;

third portions of the housing defining at least one cavity interconnecting in fluid communication said flow channel and said at least one port, said at least one cavity having a plurality of valve seats, and

the first portions of the housing having a width greater than a width of the cavity and the width of the cavity being greater than the diameter of the port..

5. The injection manifold recited in Claim 4, wherein said third portion defines said cavity having a height less than each of a width and a length of said cavity such that the flow of a liquid passing through the manifold readily impinges on an underside of a valve element in said cavity and thereby reduces stagnation.

6. The injection manifold recited in Claim 5, wherein said third portion and said valve element form a concave surface on a side of the valve element opposite from the valve seats.

7. An injection/aspiration port adapted for operation with a male Luer fitting, comprising:

a housing;

first portions of the housing defining a flow channel;

second portions of the housing defining an injection/aspiration lumen;

third portions of the housing defining a valve seat around the injection/aspiration lumen;

a valve element biased toward the injection/aspiration lumen and forming a seal with the valve seat;

a valve cage disposed in the lumen and adapted to be moved by insertion of the male Luer fitting into the lumen against the valve element to open the seal and permit two-way flow between the lumen and the flow channel;

a first body member comprising the second portions and third portions and defining the lumen and the valve seat, the lumen having an enlarged portion defining a shoulder against which the valve cage is biased when no male Luer is inserted; and

a second body member comprising the first portions and forming the housing with the first body member , said second body member including portions contacting the valve element on the side of the valve element opposite the valve seat to bias the valve element against the valve seat to form the seal.

8. The injection/aspiration port recited in Claim 7, wherein the valve cage is resilient, is biased to an expanded state, and is adapted to be compressed by the insertion of the male Luer, wherein the cage has properties for moving the valve only a small distance in response to the male Luer being inserted to any of a range of predetermined depths greater than said small distance.

9. A manifold for placement in an IV line and for sealingly connecting said IV line between an upstream portion and a downstream portion thereof, said manifold comprising:

a housing defining flow volume including a volume in a flow channel;

a plurality of fluid injection ports in said housing in fluidic communication with said flow channel;

at least one of the injection ports having at least one valve,

said at least one valve having a first valve seat, a second valve seat, and a valve element;

said valve element having properties that cause the valve element to engage said first valve seat at a first fluid pressure and to engage said second valve seat at a second fluid pressure; and

said plurality of fluid injection ports further comprising at least another injection port comprising an injection and aspiration port in the form of a needleless access connector (NAC); and

at least one check valve in the flow volume for limiting flow in at least one direction through the manifold.

10. The manifold of Claim 9, wherein said check valve is located upstream of said at least one fluid injection port.

11. The manifold of Claim 9, further comprising:

said check valve located downstream of said at least one fluid injection port, wherein:

suctioning upstream of said fluid injection valve pulls fluid from a reservoir feeding the fluid injection port and into the manifold, and

forcing IV fluid into the manifold from upstream closes the fluid injection valve and opens the check valve;

whereby repetitions of said suctioning and forcing cause a cyclical pumping of the fluid from said reservoir feeding the fluid injection port.

12. The manifold of Claim 9, further comprising:

said check valve located downstream of said at least one fluid injection port, wherein:

suctioning from said at least one fluid injection port pulls fluid from upstream in the IV line, through a portion of the manifold, and into a reservoir connected to the at least one port, and

forcing fluid through said at least one port into the manifold from the reservoir sends said fluid downstream through said check valve;

whereby repetitions of said suctioning and forcing cause a cyclical pumping of the fluid from upstream in said IV line into said reservoir and downstream through said check valve.

13. The manifold of Claim 9, said needleless access connector comprising:

a body having an end piece at a first end of said body, said end piece having an aperture therethrough, said body forming a conduit, said conduit extending in fluid communication with said aperture, an opening in a second end of said body, said second end of said body connected to said manifold with said conduit in fluid communication through said opening with said flow channel; and

an elongate valve element disposed in said conduit and comprising:

a plug at one end sealingly disposed in said aperture to prevent reflux through the aperture, and

an elastomeric shaft to resiliently bias the plug into said aperture.

14. The manifold of Claim 13, wherein said needleless access connector is connected to the manifold downstream of the check valve.

15. The manifold of Claim 9, wherein said at least one fluid injection port is an injection/aspiration port and is the next port downstream of the check valve.

16. A manifold for placement in an IV line in order to facilitate injecting fluids into and withdrawing fluids from said IV line, said manifold comprising:

an upstream connection at an upstream end, a downstream connection at a downstream end;

a first body member between said upstream connection and said downstream connection and defining a first portion of a housing;

a second body member defining a plurality of fluid injection ports and a second portion of said housing;

a plurality of cavities formed by said first portion and said second portion between said fluid injection ports and said first portion of said housing;

at least one valve in one of said cavities, said valve comprising at least one valve member, said valve member dividing said cavity into first and second parts generally adjacent to said first and second portions of said housing respectively;

said housing forming a fluidic communication therethrough between said upstream connection and said downstream connection;

said first housing member and said second housing member defining at least one flow channel between said first housing member and said second housing member and fluidically connecting said cavities; and

said manifold defining a flow volume comprising a volume in said upstream connection, a volume in said downstream connection, a

volume in said second part of said cavities, and a volume defined by said flow channel;

wherein all of the flow volume is substantially in a flow path such that substantially none of the flow volume becomes stagnant.

17. The manifold of Claim 16, further comprising a needleless access port (NAC) connected to the housing in addition to said plurality of ports.

18. The manifold of Claim 16, further comprising a check valve in said housing between at least one upstream and one downstream fluid injection port.

19. The manifold of Claim 17, further comprising a check valve in said housing between the upstream connection and at least one downstream fluid injection port.

20. A needleless access connection (NAC) in combination with a manifold having at least one injection port and adapted for use with an intravenous line, said combination comprising:

a housing with an upstream connection and a downstream connection, said housing having a first portion defining a flow channel between said upstream connection and said downstream connection;

said housing comprising a second portion integrally providing said NAC, said NAC having structure defining an injection and aspiration conduit, said second portion further providing an injection and

aspiration aperture at one end of said NAC in fluid communication with the conduit;

said housing comprising a third portion integrally defining a grate having at least one opening at another end of said NAC and extending in fluid communication with said conduit and said flow channel for fluid injection into and aspiration from said flow channel;

an elongate valve element disposed in said second portion of said housing and naturally biased into engagement with the injection and aspiration aperture;

the elongate valve element having properties for naturally forming a first seal with the injection aperture; and

the valve element having properties for moving out of said aperture in response to insertion of a male Luer into said aperture, and for resiliently moving back into said aperture of said NAC when said male Luer is removed; and

said housing further comprising said at least one injection port in fluid communication with said flow channel.

21. The combination of Claim 20, wherein said elongate valve element disposed in said second portion is also in abutting relation to said third portion.

22. An injection manifold adapted to be disposed in an intravenous line extending from an intravenous reservoir to a patient, the manifold comprising:

a first body member;

a second body member forming with the first body member a housing;

first portions of the housing defining a flow channel to receive the IV solution flowing in the IV line;

second portions of the housing defining at least one injection port with an injection lumen extending in fluid communication with said flow channel; and

third portions of the housing defining at least one injection and aspiration needleless access connection (NAC), said NAC having a housing defining a conduit in fluid communication with said flow channel at a proximal end and having a plugged aperture at a distal end.

23. The manifold of Claim 22, further comprising:

said at least on injection port having a first outside diameter;

said at least one NAC having at least a second outside diameter; and

the first portions of the housing having a width greater than the second diameter, and the second diameter having a width greater than the first diameter.